

We claim:

1. A golf ball including a composition comprising:
an unsaturated polymer;
at least two cross-linking agents; and
a peptizer.
2. The golf ball according to claim 1, wherein the composition includes from about 0.05 part to about 5 parts by weight of the cross-linking agents per 100 parts by weight of the unsaturated polymer.
3. The golf ball according to claim 1, wherein the composition includes from about 0.2 part to about 3 parts by weight of the cross-linking agents per 100 parts by weight of the unsaturated polymer.
4. The golf ball according to claim 1, wherein the composition includes from about 0.5 part to about 1.5 parts by weight of the cross-linking agents per 100 parts by weight of the unsaturated polymer.
5. The golf ball according to claim 1, wherein the composition includes:
at least one cross-linking agent having a first characteristic decomposition temperature less than 150°C for a $t_{1/2}$ equal to 0.1 hour; and
at least one cross-linking agent having a second characteristic decomposition temperature greater than 150°C for a $t_{1/2}$ equal to 0.1 hour.
5
6. The golf ball according to claim 5, wherein a composition ratio of the at least one cross-linking agent having the first characteristic decomposition temperature to the at least one cross-linking agent having the second characteristic decomposition temperature ranges from 5:95 to 95:5.
7. The golf ball according to claim 5, wherein a composition ratio of the at least one cross-linking agent having the first characteristic decomposition temperature to the at least one cross-linking agent having the second characteristic decomposition temperature ranges from 10:90 to 50:50.

8. The golf ball according to claim 1, wherein the composition includes greater than about 0.1 part by weight of the peptizer per 100 parts by weight of the unsaturated polymer.

9. The golf ball according to claim 1, wherein the composition includes greater than about 0.2 part by weight of the peptizer per 100 parts by weight of the unsaturated polymer.

10. The golf ball according to claim 1, wherein the composition includes greater than about 0.5 part by weight of the peptizer per 100 parts by weight of the unsaturated polymer.

11. The golf ball according to claim 1, wherein the peptizer is selected from the group consisting of pentachlorothiophenol, a metal salt of pentachlorothiophenol, a non-metal salt of pentachlorothiophenol, and dibenzamido diphenyldisulfide.

12. The golf ball according to claim 1, wherein the peptizer is selected from the group consisting of an amine salt of pentachlorothiophenol and an ammonium salt of pentachlorothiophenol.

13. The golf ball according to claim 1, wherein the composition further comprises an accelerator.

14. The golf ball according to claim 13, wherein the composition includes from about 0.1 part to about 10 parts by weight of the accelerator per 100 parts by weight of the unsaturated polymer.

15. The golf ball according to claim 13, wherein the composition includes from about 0.2 part to about 5 parts by weight of the accelerator per 100 parts by weight of the unsaturated polymer.

16. The golf ball according to claim 13, wherein the composition includes from about 0.5 part to about 1.5 parts by weight of the accelerator per 100 parts by weight of the unsaturated polymer.

17. The golf ball according to claim 13, wherein the accelerator is selected from the group consisting of 2-mercaptobenzothiazole and a salt of 2-mercaptobenzothiazole.

18. The golf ball according to claim 1, wherein the unsaturated polymer is selected from the group consisting of 1,2-polybutadiene, cis-1,4-polybutadiene, trans-1,4-polybutadiene, cis-polyisoprene, trans-polyisoprene, polychloroprene, polybutylene, styrene-butadiene rubber, block copolymer of styrene and butadiene, block copolymer of styrene and isoprene, nitrile rubber, silicone rubber, polyurethane, and mixtures thereof.
5

19. The golf ball according to claim 1, wherein the composition further comprises an ingredient selected from the group consisting of UV stabilizers, photo stabilizers, antioxidants, colorants, dispersants, mold releasing agents, processing aids, and fillers.

20. The golf ball according to claim 19, wherein the ingredient is a filler that adjusts a density of the composition.

21. The golf ball according to claim 19, wherein the ingredient is a filler selected from the group consisting of zinc oxide, tungsten, and barium sulfate.

22. The golf ball according to claim 19, wherein the ingredient is a filler and the composition includes from about 10 parts to about 80 parts by weight of the filler per 100 parts by weight of the unsaturated polymer.

23. The golf ball according to claim 1, wherein the composition further comprises a compound selected from the group consisting of an unsaturated carboxylic acid, a metal salt of the unsaturated carboxylic acid, and mixtures thereof.

24. The golf ball according to claim 23, wherein the composition includes from about 20 parts to about 60 parts by weight of the compound per 100 parts by weight of the unsaturated polymer.

25. The golf ball according to claim 1, further comprising:
a core; and
a cover layer over the core;
wherein at least one of the core and the cover layer includes the composition.

26. The golf ball according to claim 25, wherein the core includes:

an inner core; and
an outer core encasing the inner core.

27. The golf ball according to claim 25, wherein the core includes a material in liquid form.

28. The golf ball according to claim 25, further comprising a layer of rubber thread located between the core and the cover layer.

29. The golf ball according to claim 1, further comprising:

a core;
at least one intermediate layer over the core; and
a cover layer over the outermost intermediate layer;

5 wherein at least one of the core, the at least one intermediate layer, and the cover layer includes the composition.

30. A golf ball including a composition comprising:

an unsaturated polymer;
at least two cross-linking agents; and
a peptizer;

5 wherein:

the composition includes from about 0.05 part to 5.0 parts by weight of the cross-linking agents per 100 parts by weight of the unsaturated polymer, and

10 the composition includes from about 0.1 part to about 5 parts by weight of the peptizer per 100 parts by weight of the unsaturated polymer.

31. The golf ball according to claim 30, wherein the composition includes from about 0.2 part to about 3 parts by weight of the cross-linking agents per 100 parts by weight of the unsaturated polymer.

32. The golf ball according to claim 30, wherein the composition includes from about 0.5 part to about 1.5 parts by weight of the cross-linking agents per 100 parts by weight of the unsaturated polymer.

33. The golf ball according to claim 30, wherein the composition includes:
at least one cross-linking agent having a first characteristic decomposition
temperature less than 150°C for a $t_{1/2}$ equal to 0.1 hour; and
at least one cross-linking agent having a second characteristic decomposition
temperature greater than 150°C for a $t_{1/2}$ equal to 0.1 hour.

5 34. The golf ball according to claim 33, wherein a composition ratio of the at
least one cross-linking agent having the first characteristic decomposition temperature to the at
least one cross-linking agent having the second characteristic decomposition temperature ranges
from 5:95 to 95:5.

35. The golf ball according to claim 33, wherein a composition ratio of the at
least one cross-linking agent having the first characteristic decomposition temperature to the at
least one cross-linking agent having the second characteristic decomposition temperature ranges
from 10:90 to 50:50.

36. The golf ball according to claim 30, wherein the peptizer is selected from the
group consisting of pentachlorothiophenol, a metal salt of pentachlorothiophenol, a non-metal
salt of pentachlorothiophenol, and dibenzamido diphenyldisulfide.

37. The golf ball according to claim 30, wherein the peptizer is selected from the
group consisting of an amine salt of pentachlorothiophenol and an ammonium salt of
pentachlorothiophenol.

38. The golf ball according to claim 30, further comprising an accelerator
selected from the group consisting of 2-mercaptobenzothiazole and a salt of 2-
mercaptobenzothiazole.

39. The golf ball according to claim 30, wherein the unsaturated polymer is
selected from the group consisting of 1,2-polybutadiene, cis-1,4-polybutadiene, trans-1,4-
polybutadiene, cis-polyisoprene, trans-polyisoprene, polychloroprene, polybutylene, styrene-
butadiene rubber, block copolymer of styrene and butadiene, block copolymer of styrene and
5 isoprene, nitrile rubber, silicone rubber, polyurethane, and mixtures thereof.

40. The golf ball according to claim 30, wherein the composition further comprises an ingredient selected from the group consisting of UV stabilizers, photo stabilizers, antioxidants, colorants, dispersants, mold releasing agents, processing aids, and fillers.
41. The golf ball according to claim 40, wherein the ingredient is a filler that adjusts a density of the composition.
42. The golf ball according to claim 40, wherein the ingredient is a filler selected from the group consisting of zinc oxide, tungsten, and barium sulfate.
43. The golf ball according to claim 40, wherein the ingredient is a filler and the composition includes from about 10 parts to about 80 parts by weight of the filler per 100 parts by weight of the unsaturated polymer.
44. The golf ball according to claim 30, wherein the composition further comprises a compound selected from the group consisting of an unsaturated carboxylic acid, a metal salt of the unsaturated carboxylic acid, and mixtures thereof.
45. The golf ball according to claim 44, wherein the composition includes from about 20 parts to about 60 parts by weight of the compound per 100 parts by weight of the unsaturated polymer.
46. The golf ball according to claim 30, further comprising:
a core; and
a cover layer over the core;
wherein at least one of the core and the cover layer includes the composition.
47. The golf ball according to claim 46, wherein the core includes:
an inner core; and
an outer core encasing the inner core.
48. The golf ball according to claim 46, wherein the core includes a material in liquid form.

49. The golf ball according to claim 46, further comprising a layer of rubber thread located between the core and the cover layer.

50. The golf ball according to claim 30, further comprising:

a core;

at least one intermediate layer over the core; and

a cover layer over the outermost intermediate layer;

5 wherein at least one of the core, the at least one intermediate layer, and the cover layer includes the composition.

51. A method for manufacturing a golf ball, the method comprising:

providing:

an unsaturated polymer,

at least two cross-linking agents, and

5 a peptizer,

preparing a composition from the unsaturated polymer, the cross-linking agents, and the peptizer; and

forming the composition into the golf ball.

52. The method according to claim 51, further comprising compression molding the composition to induce cross-linking of the unsaturated polymer.

53. The method according to claim 51, further comprising applying thermal energy to the composition to induce cross-linking.

54. The method according to claim 51, wherein the composition is formed into half shells.

55. The method according to claim 54, further comprising compression molding the half shells.

56. The method according to claim 51, wherein the step of preparing the composition includes dry-blending the composition using equipment selected from the group consisting of a tumble mixer, a V-blender, a ribbon blender, and a two-roll mill.

57. The method according to claim 51, wherein the step of preparing the composition includes mixing the composition using equipment selected from the group consisting of a mill, an internal mixer, an extruder, and combinations thereof.